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In the chapter on "The organic constituents of the soil solution" is given a convincing account of the toxic substance theory of soil fertility. Any treatment of an organically poisoned soil, which will increase its absorptive properties or its oxidizing power seems to have a beneficial effect upon plants growing therein. The commonly used fertilizer salts are often effective in this way, so that there is nothing in the new theory which might lead one *not* to use the ordinary fertilizers prescribed by the "plant food" theory. This more recent finding of the Bureau of Soils makes the violent and often personal attacks, that have been calculated to hinder the progress of these investigations, appear largely as the mere pommelling of a man of straw.

The book ends with a chapter on the phenomena of alkali soils, dealing with the development of alkali and the theory of its practical handling.—
B. E. LIVINGSTON.

Fossil plants

In the second volume of his *Fossil plants*, Professor SEWARD⁴ continues the work begun over ten years ago and apparently destined to become truly monumental. It is to be hoped that his anticipation of the early appearance of the third volume on the gymnosperms may be realized, and that a fourth hinted at, rather than promised, which is to deal with the angiosperms, may likewise soon be published. The author brings very unusual qualifications to the titanic task of writing a comprehensive textbook of the present condition of our knowledge of fossil plants in both their botanical and geological bearings. He possesses in an unusual degree an acquaintance with the older paleobotany, dealing mainly with the superficial features of plants as seen in impressions, and at the same time is thoroughly in touch with the modern development of the subject, which has put the study of internal structure in the foreground. It is to be regretted that some of the younger investigators of fossil plants are often deplorably ignorant of the older point of view. SEWARD certainly does not err in the direction of the neglect of the older literature or superficial features, which in many cases constitute the only evidence available. Another advantage enjoyed by the author is his unique first-hand knowledge of the material treated. By his travels to various paleobotanically interesting regions and by personal visits to most of the important European collections, he has acquired an intimate acquaintance with fossil plants in their fullest systematic, geological, geographical, and evolutionary bearings possessed by no other living paleobotanist.

The present volume continues the treatment of the Pteridophyta begun in the first, which appeared over ten years ago. In the preface he points out the happy circumstance that recent activity has been chiefly in the field of the present volume, and that as a consequence the first is little out of date. Beginning with a continued discussion of the Sphenophyllales, the writer subscribes a very

⁴ SEWARD, A. C., *Fossil plants*. Vol. II. pp. xxii+624. *figs.* 265. Cambridge: The University Press. 1910.

qualified adherence to the views expressed in recent years in England, as to the affinity of the Psilotales with this phylum. The genus *Psilophyton*, established by the late Sir WILLIAM DAWSON of McGill University, for forms from the Devonian of eastern Canada and of Scotland supposed to be allied to the living *Psilotum*, is critically examined and rejected as being based on insufficient evidence.

The Lycopodiales are considered in 250 well-illustrated pages. Beginning with the superficial and anatomical characters of the living representatives of the group, the author, in common with all paleobotanists of standing, rejects the idea that the genus *Isoetes* has filicinean rather than lycopodineous affinities. This suggestion, first made by an English plant physiologist, seems now to be finally disposed of. The fossil Lycopodiales are discussed under the convenient captions of Isoetaceae and Pleuromeia, herbaceous fossil Lycopodiales, and arborescent Lycopodiales, a special chapter being added on those remains which the author frankly designates seed-bearing Lycopodiales.

The Filicales or fernlike Pteridophyta, together with a number of apparently allied forms, concerning which it is yet uncertain whether they are true ferns or merely fernlike seedplants, occupy the remaining and larger part of the volume. The treatment of the fossil Filicales begins with a comprehensive anatomical and systematical account of their still living allies. The anatomical treatment, as might be expected, is characterized by a decided "insularity," the views of GWYNNE-VAUGHAN, BOODLE, and other English anatomists being unhesitatingly adopted. The chapters on fossil ferns contain such a well-digested wealth of material that it is quite impossible to summarize them or even indicate their tendency in this necessarily brief review. It is enough to say that they constitute a particularly valuable part of the present volume and represent a region of the fossil field where the author is peculiarly at home.

If the work of which the volume under consideration constitutes such an important fraction is completed, as is devoutly to be desired, it will be the most complete and thoroughly modern work on the subject, and will serve to replace the now somewhat antiquated botanical part of ZITTEL's well-known *Handbuch*, compiled by SCHIMPER, SCHENK, KRAUS, and others. It is lightened and vitalized by the comparison of external and internal features of the various fossils treated, with the similar forms still living. By this method the reader, whether he be botanical or geological in his interests, acquires a vivid picture of the evolutionary sequence of plants in the history of our world.—E. C. JEFFREY.

MINOR NOTICES

Bulletin du Jardin botanique de Buitenzorg⁵ is the title resumed by the Botanical Gardens of Buitenzorg to take place of the well-known serial "Bulletin du Département de l'agriculture aux Indes néerlandaises." The

⁵ Bulletin du Jardin botanique de Buitenzorg. Deuxième série. No. I, pp. 29, pls. 4, August 1911. No. II, pp. 29, October 1911.